

January 6, 2005

EPA Region 5 Records Ctr.



362897

Mr. Dion Novak
Superfund Division
United States Environmental Protection Agency
77 West Jackson Boulevard
Mail Code: SR-6J
Chicago, IL 60604

Re: Responses to Comments on Draft RI Report
Eagle Zinc Company Site, Hillsboro, Illinois

Dear Mr. Novak:

On behalf of the Eagle Zinc Parties, ENVIRON has prepared responses to USEPA's comments on the November 5, 2004 Draft Remedial Investigation (RI) Report. USEPA's comments were provided in a letter to Ross Jones dated December 15, 2004. USEPA's comments are repeated below in *italics*, followed by ENVIRON's responses. In addition, proposed text changes to the RI Report are provided. Finally, two items are attached to this letter: A new report figure (Figure IV-10); and the revised text for Section V of the report (Site Conceptual Model).

GENERAL COMMENTS

The nature and extend [sic] discussion on COPCs is not consistent between the risk assessments and the draft RI report. For example, the draft RI does not list VOCs as PCOCs in any media, however they are listed in the conceptual site model and carried through the risk assessment text. Please correct the RI text to reflect what is described in the risk assessments. Additionally, there is no discussion related to fate and transport of specific COPCs-there is general discussion about current risks but no discussion of potential migration of detected COPCs.

Response:

To provide clarification of the purpose of the PCOCs developed during the investigative portions of the RI and the COPCs selected in Tier 1 of the Human Health Risk Assessment, the following text will be placed at the beginning of Sections III.B and IV.B:

"As discussed below, the data generated in Phase 1 [Phase 2] of the RI were compared with relevant Screening Levels to confirm/refine the PCOCs and PAOCs initially identified in the PSE Report. The results of this preliminary screening step were presented in the Phase 1 [Phase 2] Technical Memorandum and are reiterated below and in Section V. A list of Constituents of Potential Concern (COPCs) was developed in Tier 1 of the Human Health Risk Assessment (HHRA) and presented in Chapter VI of this report. The list of COPCs presented in the HHRA was selected based on standard

human health risk assessment methods and all PCOCs identified during the investigative stages of the RI (i.e., PCOCs listed in Section V) were considered in the COPC identification process in the HHRA. Additional relevant screening levels were used in the Tier 1 screening step in both risk assessments.”

To provide additional clarification concerning the development of the PCOCs listed in Section V, Footnote 29 will become the last sentence in the first paragraph of Section V.B (Site Conceptual Model).

A fate and transport discussion for each PCOC has been added to the report as Section V.A. The revised text is attached to this letter.

Is there any previous evidence of off-site transport of waste pile materials for use as cover and fill in the immediate vicinity of the site? There is another zinc oxide facility in Taylor Springs where on-site soils were transported off-site as fill.

Response:

ENVIRON and the Parties are unaware of any use of residue pile materials off site as cover or fill.

Illinois EPA RCRA personnel will be completing an inspection at the site in December 2004 to determine if there are any wastes or on-site operations remaining that were previously regulated by other programs that should be addressed by this investigation. As you may recall, EPA had raised this question previously during discussions with the site owner during the operations shutdown process-this is not addressed anywhere in this report.

Response:

Neither ENVIRON nor the Parties have knowledge of a site inspection conducted by IEPA in December 2004, not having been notified in advance or subsequent to such an inspection. As previously discussed with USEPA, any environmental sampling data generated as part of the facility closure process would be provided to USEPA for potential consideration in the RI/FS. No such environmental sampling data was generated as part of the facility closure process. The termination of the site's former NPDES permit is noted in the portion of Section I.B.2 entitled Regulatory History.

As illustrated below, please address the scenario where the residue piles may be removed from the site while evaluating additional data needs and any potential risks associated with the operation.

Response:

Any additional data needs and potential risks associated with moving or removing the residue piles will be addressed in the future addendum discussed with USEPA during the November 18, 2004 Technical Review Meeting and memorialized in the November 29, 2004 letter from John Ix, Esq. to Thomas Krueger, Esq.

Figure I-3. Please add the following dates and key events to the site timeline.

<i>Risk Science International Risk Assessment Report</i>	<i>11/82</i>
<i>UST removal under IEPA UST program</i>	<i>4/98</i>
<i>Phase 1 TM</i>	<i>3/03</i>
<i>Termination of NPDES permit</i>	<i>7/03</i>
<i>Phase 2 TM</i>	<i>11/03</i>
<i>No further remediation letter for UST removal</i>	<i>8/04</i>
<i>Human health risk assessment</i>	<i>8/04</i>
<i>Ecological risk assessment</i>	<i>8/04</i>

Response:

These additions will be made to this figure.

SPECIFIC COMMENTS

Comment 1. Page 2 par.3. A statement regarding the current use of the property is needed here.

Response:

The following statement will be added to the end of this paragraph: "Active industrial operations at the site ceased in 2003. The site awaits industrial use."

Comment 2. Page 9 Section 3 – Soil. A map showing the RSI sampling locations is needed here along with other previous sampling locations to show historical sampling in the site area.

Response:

The following statement will be added to the end of the first paragraph under the "Soil" heading: "As discussed in the PSE Report, an accurate location map for the soil samples collected by RSI was not available to ENVIRON for review. Therefore, the soil data collected by RSI were not included in the preliminary evaluation of site soil data presented in the PSE Report and the conclusions made by RSI are discussed herein for informational purposes only."

Comment 3. Page 13 Section A. A copy of the site topographic survey map should be included in this report.

Response:

A copy of this map (previously provided in Appendix A of the Phase 1 Technical Memorandum) will be added to the RI Report as Figure II-1.

Comment 4. Page 14 Section C. The text refers to three surface water bodies on-site but the figures only show two. The third is the storm water retention basin which should be identified on the report figures.

Response:

The engineered storm water retention basins will be added to all report figures on which they were not previously depicted.

Comment 5. Page 16. More information is needed here to describe why the groundwater is unsuitable and not used for potable use-this will be especially important when developing remedial action objectives for groundwater.

Response:

As explained in the HHRA and again in the RI Report (Sections II.E and VI.C.4.b), the City of Hillsboro and surrounding areas are served by a public water supply. According to a local ordinance, "...any connection whereby a private, auxiliary or emergency water supply other than the regular public water supply enters the supply or distribution system of the City..." is prohibited. According to Mr. Scott Hunt of Hurste-Roche, Inc., the City's engineering firm, the prohibition of cross-connections would preclude the use of a separate domestic well water system within a household that is connected to the municipal water system. In the approved HHRA, potable use of groundwater was evaluated, and concluded on these bases with EPA's concurrence to be an incomplete exposure pathway. This incomplete pathway is, therefore, irrelevant with regard to developing remedial action objectives for ground water.

Comment 6. Page 21 last par. It should be stated more clearly here that sampling in the piles was completed "under" the piles and not in the piles.

Response:

The third, fourth and fifth paragraphs of this section provide a detailed description of the residue sampling methodology. This section concerns the sampling of residue materials within the piles, not soils beneath the piles.

Comment 7. Page 22 last par. Typo "PAOC" should be "PCOC."

Response:

To provide consistency with a similar statement in the second sentence of the Sediment Investigation section on Page 24, "PAOCs" in this sentence will be changed to "PCOCs and PAOCs."

Comment 8. Page 23 last par. The rationale for the linear relationship between cadmium and zinc needs to be explained a little more clearly here. The test would lead the reader to believe that cadmium impacts have been understated and that the XRF was not as accurate at detecting cadmium. This is especially important when discussing nature and extent of cadmium in on-site soils.

Response:

An electronic mail message sent from Dion Novak to Ross Jones on December 28, 2004 indicated that this comment should be disregarded.

Comment 9. Page 32 Section 4. Typo "pipes" should be "piles" on first line.

Response:

This correction will be made.

Comment 10. Page 36 Section 2a. More explanation is needed to explain why Illinois Water Quality Standards were used for this comparison as screening levels.

Response:

These surface water quality standards were used in the USEPA-approved PSE Report in the preliminary evaluation of pre-RI/FS surface water data and to identify PCOCs and PAOCs for additional sampling of surface water during the RI. The Illinois Water Quality Standards were subsequently identified as potential Chemical-Specific ARARs in Table II-8 of the July 2002 RI/FS Work Plan. These standards were then used as Screening Levels in the data evaluation presented in the USEPA-approved Phase 2 Technical Memorandum, dated November 2003. As discussed in the response to the first General Comment and in the text added to Sections III.B and IV.B of the RI Report, additional relevant screening criteria were used as Tier 1 screening levels in the risk assessments. The following will be inserted as the fourth sentence of Section IV.B.2.a: "National Recommended Water Quality Criteria were used as Screening Levels for those constituents that do not have Illinois Water Quality Standards."

Comment 11. Page 38 Section 6. As written, the analysis is insufficient to support the assertion that there have been no significant dust emissions from the residue piles. The RI states only that weathering of aggregate piles reduces the potential for dust emissions. The RI does not say anything about the conditions (such as time after placement) under which erosion potential of the piles is deemed by the AP-42 authors to be very short; therefore, it is just as likely that at Eagle Zinc, there could have been significant dust emissions for many years before the RI was conducted. The term "half-life of erosion potential" is not defined so it is not clear how this information supports the assertion that erosion around the piles is not a concern. There is also no information presented to support the assertion that emissions would be spatially limited to the immediate vicinity of the pile. In fact, sample results from Area 3 indicate soil exceedences in an area that is downwind of the piles according to the wind rose diagram provided.

The previous comment regarding a figure showing historical sampling locations relative to the piles is repeated here. It would be very helpful to locate all historical soil samples that Environ is using as the basis for their residue pile dust emission conclusions on this figure along with the wind rose diagram. This will allow a better visualization as to contaminant distribution relative to prevailing wind direction. Any additional analytical information should also be presented that supports the conclusions presented in this

report. It has not been demonstrated that the on-site soil sample exceedences in Area 3 are not contaminated from the residue piles on the southern portion of the site. Finally, the conclusion that the off-site soil locations are well distributed and their concentrations not different from on-site background levels needs further clarification, such as explanation as to any statistical tests the [sic] Environ has performed to support their "no significant difference" conclusion. Additional data from the residue piles, such as contaminant concentrations from additional soil samples, would assist in supporting this request for additional clarification.

Response:

Both the HHRA and ERSE were premised on the assumption that residue piles constitute a source of metals to potential exposure media (soil and groundwater). The fact that low risk levels were associated with on-site soil serves therefore to positively support the lack of "significant dust emissions from residue piles." It is also noted that Area 3 contains at least four significant residue piles, which are more likely responsible for soil metals concentrations in their proximity than are more distant piles.

Additional information from the AP-42 reference will be added for clarification. The first paragraph of Section VI.B.6 will be replaced with: "Three lines of evidence indicate that deposition of airborne particles from the site has not impacted off-Site areas. First, literature concerning dust emissions from aggregate piles indicates that extensive off-Site windborne dust migration would not be expected. For example, Section 13.2.5.1 of the USEPA's January 1995 Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources states, 'Field testing of coal piles and other exposed materials using a portable wind tunnel has shown that (a) threshold wind speeds exceed 5 meters per second (m/s) (11 miles per hour [mph]) at 15 cm above the surface or 10 m/s (22 mph) at 7 m above the surface, and (b) particulate emission rates tend to decay rapidly (half-life of a few minutes) during an erosion event. In other words, these aggregate material surfaces are characterized by finite availability of erodible material (mass/area) referred to as the erosion potential. Any natural crusting of the surface binds the erodible material thereby reducing the erosion potential.' Therefore, any air erosion of the piles would be expected to be temporally limited to a very short period immediately following emplacement."

A new report figure has been prepared (Figure IV-10) and is attached to this letter. A discussion of this figure will replace the first two sentences of the third paragraph of Section IV.B.6 as follows: "A series of well-distributed soil samples were collected at residential properties in the vicinity of the site by IEPA in 1993. Figure IV-10 shows the IEPA off-site residential soil samples and RI/FS laboratory-analyzed on-site soil samples taken in the Northern Area, concentrations of the metals in these samples that were identified as PCOCs in the investigatory phases of the RI, and a superimposed wind-rose diagram. As shown on Figure IV-10, metals concentrations generally decrease with distance from the site. Moreover, with the exception of arsenic, vanadium, and manganese, all metals concentrations in the IEPA soil samples were below conservative USEPA screening levels for residential soils (USEPA Region 3 RBCs). As discussed in

Section VI.B.3 of the RI Report, the arsenic concentrations detected above the USEPA Region 3 RBC of 11.2 mg/kg (11.9, 13.4 and 13.6 mg/kg, respectively) were only marginally above the average regional background level, as reflected by the non-Metropolitan Statistical Area (MSA) background value presented in the Illinois Tiered Approach to Corrective Action Objectives (11.3 mg/kg). In addition, arsenic is not known to have been used or released at the site. All of the vanadium concentrations detected in the off-site soil samples were within the range of natural background concentrations for this metal (10-100 mg/kg) and below the mean background concentration of 62 mg/kg.¹ Finally, the RBC for manganese was marginally exceeded, but in only one sample.”

Pre-RI/FS on-site soil data collected by Goodwin-Broms, Inc. in 1998 (previously presented in PSE Report) were not depicted on Figure IV-10, as the non-leachate analyses were limited to lead and cadmium.

Comment 12. Page 40 Section V. There are inconsistencies between the table presented here and the COPCs that have been carried through the risk assessments. There are additional COPCs used in the risk assessments that are not listed in the text, such as lead in on-site soil and VOCs in the drainageways. Please correct this table.

Response:

See response to the first General Comment.

Comment 13. Page 42 Section VI. A statement should be added to the introduction that says that potential exposure pathways from the residue piles is not addressed in this section and will be the subject of additional investigation. It should also be stated that EPA has already provided significant comments on this risk assessment through previous submittal and comment.

Response:

As indicated in the response to Comment 11, both the HHRA and ERSE were premised on the assumption that residue piles constitute the primary source of metals to potential exposure media (soil and groundwater). This basic assumption was explicitly depicted in Figure 2 of the HHRA and reproduced in Figure VI-1 of the RI Report. As such, it would be inaccurate to state that potential exposure pathways from the residue piles are not addressed. In addition, as stated in the response to the fourth General Comment, any additional data needs and potential risks associated with moving or removing the residue piles will be addressed in the future addendum discussed with USEPA during the November 18, 2004 Technical Review Meeting and memorialized in the November 29, 2004 letter from John IX, Esq. to Thomas Krueger, Esq.

¹ Dragun, J. and Chiasson, A. 1991. *Elements in North American Soils*. Hazardous Materials Control Resources Institute.

The following language will be inserted at the end of Section VI.A.1 to indicate USEPA's participation in development of the HHRA: "This HHRA was developed in accordance with applicable EPA guidance and multiple discussions with EPA Region V personnel."

Comment 14. Page 73 Section 3a. What are the contributors to the T1CR for the onsite commercial worker listed here? It states on page 77 that arsenic is the main contributor and that levels are below background. This still results in risks above 1×10^{-6} . Please explain.

Response:

In place of the second sentence of Section VI.F.3.a, the following will be inserted: "The cumulative T1CR was 5×10^{-6} , which is slightly above the EPA acceptable target risk value of 10^{-6} but well below the upper bound of EPA's target cancer risk range (10^{-4}). 99.5% of the estimated risk was due to arsenic. The representative concentration for arsenic of 7.93 mg/kg is less than the Illinois background concentration of 11.3 mg/kg, but results in apparent exceedance of the 10^{-6} risk level because of the high degree of conservatism inherent in the arsenic toxicity criteria and the lack of consideration of the reduced bioavailability resulting from soil association. Indeed, the Illinois background concentration would result in an apparent risk of 6×10^{-6} . The fact that even background levels of this metalloid result in exceedance of the target risk level indicates that the cumulative T1CR is insignificant."

Comment 15. Page 74 subsection c. What additional information is needed to fully evaluate the lead found in samples SD-WD-8 and SD-WD-7 listed here? What is the potential that this lead is site related? Please provide any data supporting any conclusions addressing this comment.

Response:

As discussed in Section VI.C.3 of the RI Report, the portions of the Western Drainageway where these samples were collected are small (5-6 feet wide) and surface water flow is intermittent. These locations are also relatively inaccessible, as they are: (1) heavily overgrown with brush; (2) extremely marshy; (3) in a basin that is surrounded to the north, south and east by steep slopes; and (4) located on private property owned by Fuller Brothers Concrete and Hixson Lumber. No residential properties are intersected by, or back directly up to these locations. Therefore, it is unreasonable to assume that there would be any regular human contact with sediments in these areas.

While all COPCs identified in the drainageways have been treated as Site-related, there is a potential contribution of certain constituents from adjacent industrial properties.

There are no suitable human health screening levels for lead. Furthermore, it was concluded in the ERSE that, while adverse exposures were predicted for some exposure scenarios in the Western Drainageway, they were not indicative of ecologically significant impacts to populations, communities, or ecosystems. This conclusion was based on the following findings of the ERSE:

- Threatened and endangered species are not present at or in the vicinity of the Site.
- The predicted adverse impacts associated with surface water and sediments were typically in areas with poor habitat characteristics, and/or limited spatial extent.
- Observations by biologists and ecologists during multiple Site reconnaissance activities did not result in the identification of adverse ecological impacts to individuals, populations, or communities.

The last sentence of the second paragraph of this section will be replaced with:
“However, it is highly improbable that occasional contact with sediment-associated lead could result in adverse human health effects. Therefore, no further information is needed to evaluate lead in these sediments.”

Comment 16. Page 86 Appendix A-6. The information in this appendix does not provide, nor was it intended to provide, conclusive evidence that the physical impacts are not site-related. The causes of the low flow, sedimentation, etc. were not investigated in the October 2004 site visit. The statement “..not related to the site” should be removed from this bullet.

Response:

The clause “not related to the site” has been removed from the bulleted text. For the record, it should be noted that the information presented in the aquatic habitat assessment that is referred to in this bullet as providing conclusive evidence of severely limited habitat quality relates to physical parameters/conditions that are not reasonably attributed to the site (e.g., low flow, lack of pools, vegetative cover, channelization, canopy). As an example of this point, the one “non-natural” physical condition observed during the aquatic habitat assessment (rubble/construction debris in the vicinity of WD-6) was from bridge/roadwork completely unrelated to the site (this conclusion can be made even though the appendix does not provide, nor was intended to provide, conclusive evidence that the physical impacts are not site-related).

Comment 17. Page 96 last par. This information should be updated as a result of the additional information requested regarding potential off-site emissions from the residue piles.

Response:

See response to Comment 11.

Comment 18. Page 127 and 130 D.2.b. and c. A re-evaluation of risks to the mink with the assumption that mink will travel overland to the pond for fish.[sic] Although home range considerations are likely to limit population level impacts, as was the case for the green heron, the assumption in the RI that the mink will not travel overland to the pond may be incorrect and suggests that the mink was not a suitable surrogate receptor.

Response:

The text in Section D.2.b pertaining to the Western On-Site Drainage has been revised to provide an expanded discussion of mink behavioral and exposure information for the

purposes of putting the BERA HQs for mink in this drainage in context and to support the conclusion drawn for the Western On-Site Drainage. The text has been revised in Sections D.2.b and D.2.c as follows:

Section D.2.b:

Western Drainage: On Site

“The evaluation of on Site surface water in the Western Drainage involved three sampling locations (Table VII-15b; Figure VII-5a). The HQs are greater than the threshold value for cadmium and zinc at all three locations. For the mink, zinc HQs range from approximately 8 to 30, and cadmium HQs range from 20 to 500. HQs of these magnitudes indicate that adverse impacts could occur for mink that obtain 100 percent of their diet from fish in the pond. However, mink home ranges are large in relation to the pond and mink diets are very diverse, including fish, a broad array of other aquatic organisms (crayfish, amphibians), aquatic oriented mammals and waterfowl (muskrat, ducks), and terrestrial mammals and birds (rodents, rabbit, and ground dwelling birds) (USFWS, 1984).

Mink home ranges are comprised of relatively large areas; studies have shown that mink home ranges can range from 0.5 miles to 3 miles, depending on the quality of the habitat and the availability of food (Stokes and Stokes, 1986). Within their home ranges throughout the year, male and female mink find suitable habitat near streams characterized by abundant cover (e.g., emergent wetlands and fallen trees/snags) and pools for foraging (USFWS, 1984; Stokes and Stokes 1986). Mink avoid exposed or open areas, with greater than 50 percent canopy cover being considered suitable (USFWS, 1984). More than half of the on Site pond shoreline lacks the cover needed by mink. Furthermore, the shallow drainage that flows downstream from the pond does not provide the flow regime nor forage habitat preferred by mink until the confluence with the unnamed tributary (and in the unnamed tributary the cover is suboptimal). Therefore, since the pond is approximately 1 acre in area (i.e., 0.05% to 0.3% of the mink’s home range), both the amount of exposure that mink would have to the pond (and downstream drainage areas) and the number of mink exposed to the pond would be severely limited. As a result, even if adverse impacts to mink related to cadmium and zinc in the pond were to occur, these impacts would be very limited and would not be expected to result in impacts to a mink population. Even with greater use of the pond by mink should habitat conditions change, fish from the pond will remain a small portion of the mink diet, resulting in only limited impacts (if any) to a limited number of individual mink.”

Section D.2.c (2nd paragraph):

“In the Western Drainage, the on Site storm water pond presents challenges for understanding potential risks to piscivorous wildlife. Adverse impacts to mink can be ruled out base on exposure considerations. Specifically, exposures would occur for only a limited number of mink, and only for short durations as the pond only provides a small portion of the home range. Further, fish from the pond would comprise a small portion of

the food in a mink's diet. Therefore, if adverse impacts related to cadmium and zinc in the pond were to occur, these impacts would be very limited and are not considered likely to result in impacts to a mink population. With regard to the green heron, ..."

Comment 19. Page 126 and overall conclusions in Section VII.D.5 SMDP and Section VIII.C. Change the conclusions on page 123 and in subsequent sections to note that the impacts described in the ERA are adverse chemical impacts for the current condition. Adverse chemical impacts were not observed at the site, but, if occurring, are likely to be indistinguishable from physical impacts at the site. Physical impacts were observed that would result in ecological impacts, possible even at the population, community or ecosystem level, and these physical impacts may also exclude ecological receptors, thereby limiting the current chemical exposure and the potential for adverse chemical impacts.

In an electronic mail transmission from USEPA dated December 28, 2004, the following clarification was provided concerning Comments 19 and 20: *USEPA agreed that the survey describes poor physical condition-scouring, sedimentation, etc. (i.e. poor habitat) in the drainageways. In the RI Report, this information was integrated to say that since chemical effects were not observed in the survey, there is no risk. The RI should be modified to say that since there is poor habitat, chemical impacts may have been masked, or, more likely, ecological receptors were excluded and exposure was limited. If eco receptors stay away because of poor habitat, then they should not be exposed to high chemical concentration. The RI should reiterate that this is the "current" condition and any changes to the physical condition (i.e. if the habitat gets better - redevelopment, remediation, etc) may unmask chemical effects or increase exposure by providing more suitable habitat. The potential for long term monitoring for the drainageways should be considered, at least until the site is developed or the concentrations in the drainageways attenuate, because chemical concentrations in the drainageways may be high enough to cause eco effects if suitable habitat is also available.*

Response:

The next to last sentence in Section VII.D.1.c on page 123 has been revised to state, "Consideration of all available lines of evidence indicates that adverse impacts due to site-related constituents, if occurring, are not ...".

The second bullet in Section VII.D.5 on page 138 will be revised to state, "Adverse impacts associated with exposure to site-related constituents in surface water and sediment are predicted, ...".

The third bullet in Section VII.D.5 on page 138 will be revised to state, "Adverse impacts associated with exposure to site-related constituents in soil are not likely."

The final paragraph in Section VII.D.5 on page 138 will be revised as follows:

"Based on this information, the few exposure scenarios where adverse impacts due to potential exposures to site-related constituents are predicted are not indicative of

ecologically significant impacts to populations, communities, or ecosystems (a primary risk management consideration according to USEPA [1999]). Indeed, it appears that less-than-adequate physical conditions (i.e., poor habitat quality) at and in the vicinity of the site currently restrict ecological function associated with the site far more than potential exposures to site-related constituents. Therefore, it is concluded that the available information is adequate to decide that ecological risks due to site-related constituents are negligible at the Eagle Zinc Site and, therefore, there is no need for further action on the basis of ecological risk.”

This information will be carried into revisions to Section VIII.C.

The following responses pertain to USEPA’s December 28, 2004 electronic mail transmission:

- The statement that information pertaining to poor physical conditions in the drainageways “was integrated in the RI to say that since chemical effects were not observed in the survey, there is no risk” is incorrect. In both the ERSE and the RI, a weight-of-evidence approach (incorporating chemical, toxicological, biological, and exposure information, as well as information pertaining to physical conditions) was used to, eventually, come to the conclusion that ecologically significant impacts to populations, communities, or ecosystems are not indicated (that is, that the risks are acceptable).
- The primary constraints on aquatic habitat quality and the ability of these drainages to support aquatic wildlife are related to physical conditions [as stated by USEPA in the expanded comment: *USEPA agreed that the survey describes poor physical condition- scouring, sedimentation, etc. (i.e., poor habitat) in the drainageways*”] It is not reasonable to anticipate that future site use and/or redevelopment would be associated with a net positive effect on the overall physical conditions of the drainageways. Therefore, consideration of long term monitoring in the drainageways is not warranted.

Comment 20. Section VII.D.5 SMDP and Section VIII.C. The 4th bullet and the last paragraph on page 138 need to be modified as per comment 19. Adverse chemical impacts were not observed or are predicted based on the current condition. Physical impacts were observed that would result in ecological impacts, and these physical impacts are indistinguishable from any chemical impacts and/or are excluding ecological receptors (resulting in the spatially limited exposure scenario).

Response:

See the response to Comment 19 regarding revisions to page 138. However, the fourth bullet will not be revised, as it is an accurate statement (also, see the response to Comment 16).

Comment 21. Section VII.D.5 SMDP and Section VII.C. The conclusions for the Ecological Risk Screening Evaluation should note that the direct exposure to the residue piles was not addressed. [EPA provided correction that this comment should refer to Section VIII.C rather than Section VII.C]

Response:

The following will be added to the end of the first sentence in Section VIII.C: “(but not direct exposure to the residue piles)”. However, this type of information is inappropriate for inclusion in the SMDP discussion in Section VII.D.5.

Comment 22. Page 146 Section VIII. The data collected during the RI and presented here is not presented in a way that identifies any potential hot spots that may need to be addressed in the site remediation. Information that has been presented in the draft RI tries to show site factors that illustrate that identified data exceedences don't pose significant risk, these “hot spots” still need to be carried forward into the feasibility study, where remedial action objectives and potential remedial alternatives are developed that will address areas on-site where exceedences have been identified. This is also consistent with EPA's presumptive remedy for metals in soils, which targets hot spots for potential treatment as a targeted goal while evaluating containment alternatives for overall site contamination. Ultimately, these hot spots may or may not require active remediation, but EPA needs the information to make this determination in the feasibility study and in site remedy decision documents.

Response:

The complete data sets are provided in Appendix VI-2 of the RI Report. The COPC selection process for each potential exposure medium is provided in Tables VI-3 to VI-6, and summarized in Table VI-7, which provides both representative concentrations calculated in accordance with EPA guidance (and indeed re-calculated using the software preferred by EPA) and maximum detected concentrations. There is no indication of “hot spots” in these data. In fact, if potential risks were calculated using maximum detected concentrations in soil, for the most-exposed receptor scenario, the commercial/industrial worker, the cumulative cancer risks would not exceed 10^{-5} and the cumulative hazard index would be less than 1. These hypothetical cancer risks and hazard quotients are provided in the following table.

Soil COPC	Rep Con	Max	Max/Rep	Max Cancer Risk	Max Hazard
Arsenic	7.93	13	1.6	7.37E-06	4.52E-02
Cadmium	31.9	87	2.7	5.67E-08	9.65E-02
Iron	25,000	47000	1.9		1.37E-01
Manganese	506	1900	3.8		1.12E-01
Vanadium	50.6	72	1.4		3.33E-02
Zinc	3,010	11000	3.7		4.28E-02
Total:				7.43E-06	4.68E-01

Comment 23. Page 146 Section A. The PCOCs identified here are not the same as those identified in Sections III.B and IV.B.

Response:

See response to the first General Comment.

Comment 24. Page 146 Section B. The conclusions for the HHRA should indicate that potential exposure pathways from the residue piles were not addressed. It will also be helpful to identify the areas where the risk exceedences are located, to allow for potential hot spot analysis in the feasibility study. The scenario where the piles may be removed from the site is still being pursued and this potential exposure scenario should be further investigated, both for human health and ecological risk, including any potential for emissions during excavation/removal from the site. The IDPH study was completed before any completed site characterization information or risk analyses was completed for the site. This should be mentioned in the text here so that the reader understands the difference.

Response:

As discussed in the responses to Comments 11 and 13, all potential exposure pathways have the residue piles as a source. As a result, potential exposure pathways from the residue piles have been thoroughly evaluated. As discussed in the response to Comment 22, there is no indication of “hot spots” in the soil data.

As discussed in the response to the fourth General Comment, what remains to be evaluated is potential exposure associated with moving the piles. While some short-term physical hazards (and, to a much lesser extent, potential chemical hazards) are generally associated with such activities, protection against such hazards is the province of project-specific health and safety measures, not chronic risk assessment.

The following sentence has been added to the end of this paragraph and a similar paragraph in Section VI.G: “The IDPH health consultation was prepared before initiation of data collection activities for the RI/FS and the RI/FS risk assessments.”

Comment 25. Page 147 Section C. Please see comments regarding potential hot spots as they relate to date exceedences and potential exposure pathways which may need to be addressed in the site FS.

Response:

See responses to Comments 22 and 24.

Comment 26. Page 148 Section D. The second and third paragraphs of this section should be deleted, because they are not based on information presented in the RI. As stated in the RI, additional data will be collected to better evaluate the potential exposures and risks posed by the residue piles. The previous TCLP data indicated exceedences for lead, which indicates potential leaching to groundwater issues that may

need to be addressed in the FS. This should be included in the residue pile summary described here.

Response:

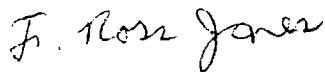
ENVIRON agrees to remove the referenced paragraphs; however, information in the second paragraph is relevant to fate and transport mechanisms and has been integrated into Section V (see attached revision).

The TCLP data are relevant only with respect to the potential regulatory status of the materials under RCRA. The SPLP data for metals collected during the Phase 1 investigation, which are a better indicator for potential leaching to ground water, do not suggest significant leaching of metals from the residues to soil or ground water. Nevertheless, potential leaching of contaminants to ground water was fully addressed through the sampling of soil and ground water and the evaluation of these data in the risk assessments.

We appreciate the opportunity to respond to these issues and would like to discuss them with you further at your convenience.

Sincerely,

ENVIRON International Corporation



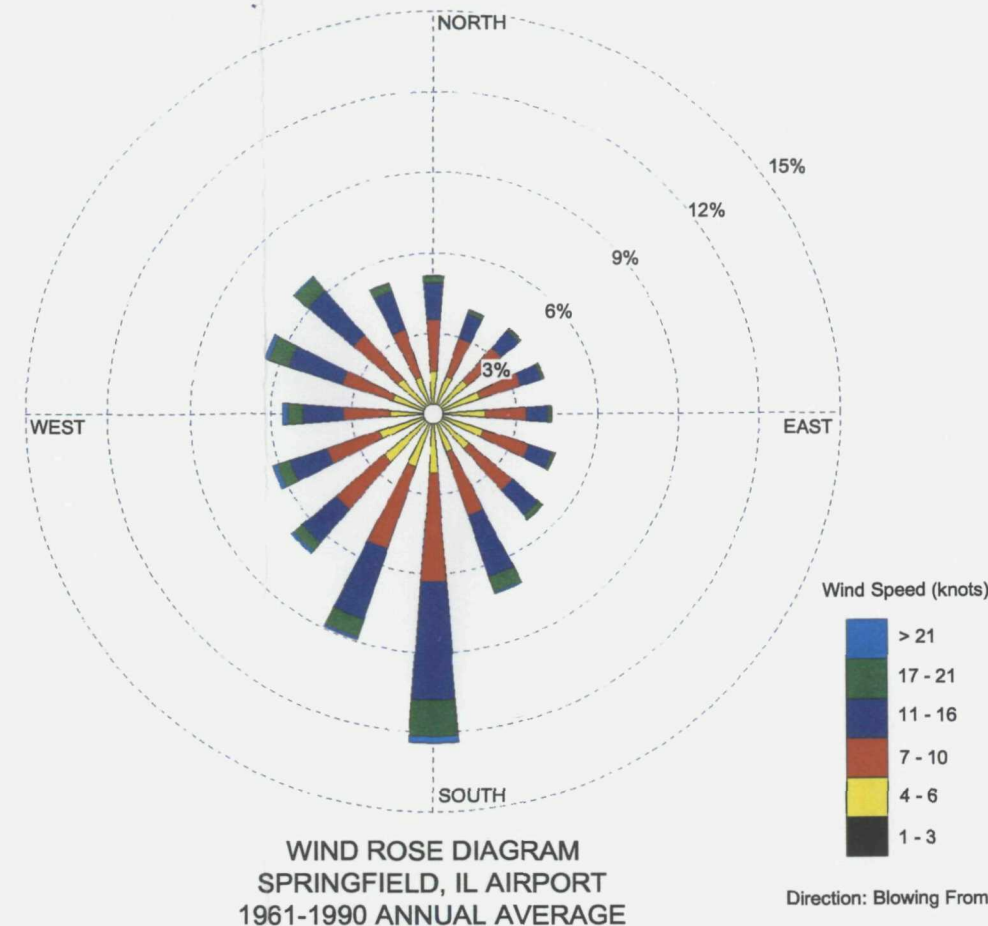
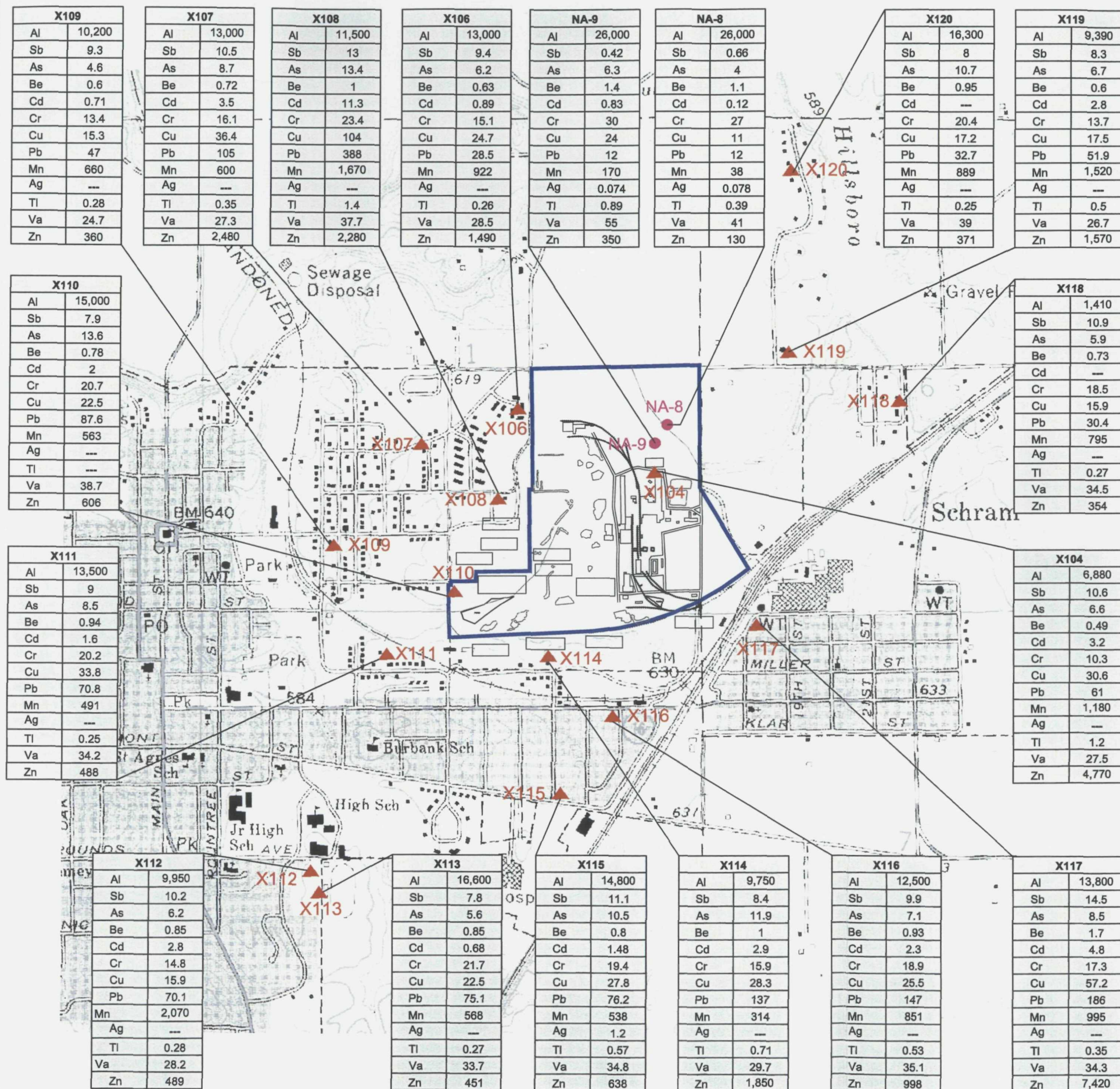
F. Ross Jones, P.G.
Manager

Attachments

FRJ:rms

R:\Client Project Files\Eagle Zinc-Hillsboro_21-7400E\RI Report\RI Draft_110504\Resp to Cmmts ltr_FINAL 010605.doc

cc: Thomas Krueger – USEPA, Region 5
Rick Lanham – IEPA
Lisa Cundiff – CH2M Hill
John Ix – Dechert
Paul Harper – Eagle-Picher
Gordon Kuntz – The Sherwin Williams Company
Roy Ball – ENVIRON International Corporation



X101-B/G	
Al	12,400
Sb	8.9
As	5.8
Be	0.8
Cd	---
Cr	16.2
Cu	20
Pb	148
Mn	434
Ag	---
TI	0.33
Va	28.5
Zn	136

X102-B/G	
Al	10,000
Sb	9.2
As	5.7
Be	0.81
Cd	---
Cr	14.4
Cu	19.7
Pb	236
Mn	686
Ag	---
TI	0.34
Va	27.1
Zn	138

SAMPLE ID	
Constituent	Concentration mg/kg
Al	78,000
Sb	31
As	11.2
Be	160
Cd	78
Cr	230
Cu	3,100
Pb	400
Mn	1,600
Ag	390
TI	6.3
Va	23
Zn	23,000

USEPA REGION 3 RBCs	
Al	78,000
Sb	31
As	11.2
Be	160
Cd	78
Cr	230
Cu	3,100
Pb	400
Mn	1,600
Ag	390
TI	6.3
Va	23
Zn	23,000

NOTES:

- Concentrations in milligrams per kilograms.
- Except for X104 and X110, all samples collected in 1993 by IEPA from ground surface at residential properties.

ENVIRON

**HISTORICAL OFF-SITE SOIL SAMPLING RESULTS
EAGLE ZINC
HILLSBORO, ILLINOIS**

DATE: 01/04/05	CONTRACT NUMBER: 21-7400E	FIGURE IV-10
DRAFTER: APR	APPROVED:	REVISED:



V. SITE CONCEPTUAL MODEL

A. Contaminant Fate and Transport

The following is a generalized discussion of the fate and transport of the constituents identified as PCOCs (tabulated below). Non-toxic species (e.g., iron and sulfate) are excluded from this discussion. While none of the PCOCs discussed below were excluded from the evaluation of site data in the risk assessments, a refined list of Constituents of Potential Concern (COPCs) was developed in Tier 1 of the HHRA, as discussed in Section VI of this report.

Metals

Certain metals were identified as PCOCs in on-site soil, sediments in both drainageways, ground water, and surface water. Predicting the migration of metals in the environment is complicated because metals can exist in a variety of forms. For instance, they may exist as charged particles, such as ions in solution, or in an uncharged or neutral state. Metals may also interact with both inorganic and organic species to form a variety of different compounds of variable solubilities. Multiple oxidation states of some metals further complicate their behavior.

The potential for migration of any form depends upon the solubility of the form in water. Metals in solution exist in an ionic form. These ions may be transported as such, or undergo processes such as adsorption to organic matter or mineral surfaces of sediment, soils, and suspended solids. Nonionic forms tend to precipitate and remain bound to sediments and soil or they may be transported as suspended solids. Metals may cycle between the aqueous and solid phases with limited actual transport from the site area. Metals will often be present as compounds that may have different physical-chemical properties to the metals themselves. Below are general descriptions of the environmental behavior of the metals identified as PCOCs following completion of the investigative phases of the RI.

Aluminum

Aluminum is highly reactive and, in nature, is found in combination with other substances such as oxygen, fluoride, and silica. There is only one oxidation state for aluminum, 3+. Due to its single oxidation state, aluminum is not redox-sensitive. Major transport processes include leaching from geochemical formations and soil particulates to water, complexation, and adsorption onto soil or sediment particulates. In general, the mobility of aluminum increases as the pH decreases below 5 or increases above 10 for monomeric forms. At low pH, adsorption onto clay and suspended particulates is a significant and rapid process. Below a pH of 5 the aluminum 3+ reacts strongly with the negative organic ligands of organic acids.

Antimony

Antimony in the atmosphere is in particulate form and can be adsorbed to particulate matter. Transport to land and surface water occurs through gravitational settling and other forms of dry and wet deposition. The fate of antimony in the environment is complicated because it can exist in four oxidation states, 3-, 0, 3+, and 5+. In the aquatic environment, antimony is mainly associated with particulate matter and tends to settle out in areas of active sedimentation. Some forms of antimony are strongly sorbed to soil, making it relatively immobile. Antimony may also adsorb strongly to colloidal materials in soil which may become mobilized and transported to ground water. In general, adsorption is greatest at near neutral pHs.

Arsenic

Because of its multiple oxidation states and its tendency to form soluble complexes, the geochemistry of arsenic is both intricate and not well characterized. Arsenic is mobile in the aquatic environment; it cycles through water columns, sediments, and biota. The solubility of arsenic varies widely according to the oxidation state. In the natural environment, four oxidation states are possible for arsenic: 3-, 0, 3+, and 5+. The adsorption of arsenic onto clays, iron oxides, and humic material are important fate processes. Co-precipitation or sorption of arsenic with hydrous oxides of iron is probably the most important removal process. Arsenic may also be isomorphously substituted for phosphate in phosphate minerals. The rate and extent of adsorption decreases with increasing salinity and increasing pH. Adsorption is highest in aerobic, acidic, and freshwater systems. Arsenic is relatively immobile in soils due to its binding to soil particles, but may be leached under the appropriate conditions. It binds to clay, iron oxides, aluminum hydroxides, and organic matter.

Beryllium

The behavior of beryllium is controlled largely by precipitation, adsorption, and complexation. It exists in the valence state, 2+. Soluble beryllium salts are hydrolyzed in waters to form insoluble beryllium hydroxide. Adsorption to clay and minerals is important at low pH. Beryllium can form complexes, oxycarboxylates, and chelates with a variety of materials resulting in increased solubility of beryllium species. In natural waters, most of the beryllium is found in particulate form, either sorbed or precipitated.

Cadmium

Complexation, adsorption, co-precipitation, isomorphous substitution, and bioaccumulation are processes which affect the movement of cadmium in the environment. Cadmium exists in one oxidation state, 2+. Compared to the other heavy metals, cadmium is relatively mobile at

an approximate pH of less than 5 and greater than 9 and may be transported as either hydrated cations or as organic or inorganic complexes. Cadmium forms complexes with humics, predominately CO_3^{2-} , SO_4^{2-} , and also OH^- and Cl^- . Sorption to mineral surfaces generally increases as the pH increases within the approximate pH range of 5 to 9 and is responsible for removal of cadmium from the aqueous phase. Other processes which serve to remove cadmium from water include adsorption onto organic matter, co-precipitation with hydrous metal oxides and isomorphous substitution in carbonate minerals.

Chromium

Chromium has three oxidation states: 2+, 3+, and 6+. However, in aqueous systems, it exists primarily in two oxidation states, 3+ and 6+. The hexavalent form is the most common form in natural waters. This species is soluble, existing in solution as an anion complex which may eventually precipitate. Hexavalent chromium is a strong oxidizing agent and reacts with organic or other reducing material to form trivalent chromium. Hexavalent chromium (Cr^{6+}) is not absorbed to any significant degree by clays or hydrous metal oxides. It is, however, absorbed strongly to activated carbon, which is an indication that it may be retained by organic matter. Hexavalent chromium is quite mobile in the environment. Trivalent chromium combines with aqueous hydroxide ion (OH^-) to form insoluble chromium hydroxide [$\text{Cr}(\text{OH})_3$]. Precipitation of this material is thought to be the dominant removal process of chromium in natural waters. Adsorption processes also result in removal of dissolved chromium to the bed sediments. Chromium in soil can occur as the insoluble oxide dichromate (Cr_2O_3).

Copper

Copper exists in two oxidation states, 1+ and 2+. The only cuprous (Cu^+) compounds that are stable in aqueous solutions are highly insoluble (i.e., CuCl , CuF , and CuCN). Most of the cupric salts (Cu^{+2}) are also relatively insoluble. Cu^{+2} forms coordination compounds or complexes with inorganic and organic ligands such as ammonia, chloride, and humic acids. These complexes tend to enhance both its solubility and its adsorption to clay and other surfaces. In soils, copper is strongly adsorbed and most of it remains within the upper few centimeters of soil.

Lead

Lead exists in the 2+ and 4+ valence states. Sorption to sediments is the dominant fate process of lead in natural waters. Precipitation with hydroxides, carbonate, sulfate, and sulfide results in decreased dissolved lead concentrations. Lead undergoes specific adsorption at mineral interfaces, precipitation of sparingly soluble solids, and formation of relatively

stable organic-metal complexes/chelates with organic matter. Complexation of lead with organic matter increases its adsorptive affinity for clays and other mineral surfaces. Lead is strongly retained by most soils.

Manganese

Six oxidation states exist for manganese: 1+, 2+, 3+, 4+, 6+, and 7+ (with 2+, 3+, 4+, and 7+ being the most common). From pH 4 to pH 7, Mn^{2+} predominates; above pH 8, the higher oxidation states dominate. The principle anion associated with Mn is CO_3^{2-} ; $MnCO_3$ is relatively insoluble. Most of the manganese present in the soil will likely be present in the 2+ valence state. In oxidizing environment, manganese solubility is controlled by oxidation of Mn^{2+} to Mn^{3+} and Mn^{4+} . In reducing environments, manganese solubility is controlled by the poorly soluble manganese sulfide.

Silver

Silver exists in two oxidation states: 1+ and 2+. Silver occurs primarily as sulfides and in association with iron, lead, tellurides, and gold. Under oxidizing conditions in surface water and soils, the primary silver compounds are bromides, chlorides, and iodides, while under reducing conditions, the free metal and silver sulfide predominate. In surface water, silver exists as a monovalent ion, as part of more complex ions with chlorides and sulfates, and by adsorbing onto particulate matter. Both the silver halides and silver sulfide have very low aqueous solubilities. Soil mobility is affected by drainage, redox conditions, pH, and organic matter content. Silver is strongly adsorbed to manganese and iron oxides, organic matter, and clay minerals.

Thallium

Thallium typically exists in the environment combined with other elements such as oxygen, sulfur, and the halogens. Thallium valence states are 1+ and 3+. These compounds are generally quite soluble in water. Thallium is typically found as the monovalent ion (Tl^+), but may be trivalent (Tl^{3+}) in very oxidizing environments. In surface water, thallium often precipitates as a sulfide (Tl_2S). Thallium tends to adsorb to soils and sediments.

Zinc

Zinc occurs in the environment primarily in the 2+ oxidation state. Zinc is likely to be strongly sorbed in soil; however, soil conditions (i.e., sorption potential and pH) will affect the tendency of zinc to be sorbed. In waters, the metal often forms complexes with a variety of organic and inorganic compounds and partitions into sediments. Therefore, sorption of zinc is the dominant fate of this metal in the aquatic environment.

Volatile Organic Compounds

Three VOCs were identified as PCOCs: vinyl chloride (sediment); cis 1,2-dichloroethene (surface water); and trichloroethene (surface water).

In general, the partition of VOCs between different media reflects a dynamic equilibrium unless volatilization is hindered. Volatilization is expected to be a dominant transport mechanism leading to the escape of VOCs from surface waters. Additionally, these compounds may be quite mobile in soils and tend to leach to ground water. In the presence of elevated soil organic carbon content, the VOCs would be expected to sorb to the organic carbon. The routes of migration in the environment for these compounds are discussed below.

Where present in surface waters or on soil surfaces, the halogenated VOCs identified as PCOCs will predominantly volatilize into the atmosphere. These compounds are moderately to highly mobile in soil and susceptible to significant leaching. In subsurface regions where volatilization cannot occur, these compounds are slowly to moderately degraded.

B. Site Conceptual Model

Based on an evaluation of pre-existing site data, affected environmental media, PCOCs, PAOCs, and potential exposure routes were identified as a preliminary Site Conceptual Model (SCM) in the PSE report. As discussed in the RI/FS Work Plan, the Site Conceptual Model was modified and supplemented as necessary during the course of the RI, as RI/FS data were collected and evaluated. The generalized SCM presented in tabular form below was prepared at the culmination of the Phase 2 investigation (November 2003) and was used as a preliminary gauge of the constituents, areas, media and pathways to be evaluated in the HHRA and ERSE. However, the generalized SCM was not used to limit or focus the body of site data used in the initial screening stages of the risk assessments. PCOCs listed in the SCM include constituents identified as PCOCs in the PSE Report using pre-RI site data, but which were not confirmed as PCOCs following completion of Phases 1 and 2 of the RI (i.e., chromium and lead in surface water).

Notwithstanding the preliminary information presented for the residue piles summarized in the following tables, the residue piles were not explicitly considered as potential exposure media to either human or ecological receptors in the risk assessments. The large size of the residue pieces that comprise the piles precludes exposure via ingestion, inhalation, or dermal contact, nor are the piles attractive to ecological receptors for purposes of habitation, nesting, or foraging. However, the residue piles were implicitly included in the risk assessments as potential primary sources of metals. That is, the degree of mobility of metals contained in the residues is represented in the existing on- and off-site soil, sediment, surface water, and ground water data that were used to estimate the potential risks to defined human and ecological receptor populations. However, as

discussed in Section VIII.D of this report, potential human and ecological risks that may be associated with exposure to materials in the residue piles will be explicitly assessed as an addendum to the risk assessments.

POTENTIAL CONTAMINANTS OF CONCERN (PCOCs)					
On-Site Soil	Sediment – Western Drainageway	Sediment – Eastern Drainageway	Residues	Ground Water	Surface Water
Analytical Fractions					
TAL-Metals	TAL-Metals	TAL-Metals	TCLP Metals	TAL-Metals	TAL-Metals
Cadmium	Antimony	Antimony	TCLP-Lead	Cadmium	Cadmium
Lead	Arsenic	Arsenic		Lead	Chromium
Zinc	Beryllium	Beryllium		Manganese	Copper
	Cadmium	Cadmium		Thallium	Lead
	Lead	Lead		Zinc	Manganese
	Silver	Silver		Iron	Zinc
	Thallium	Thallium			Iron
	Zinc	Zinc			
	Organics	Organics		Other Inorganics	Other Inorganics
	Vinyl Chloride	Vinyl Chloride		Sulfate	Sulfate
					Organics
					Cis 1,2-Dichloroethene
					Trichloroethene

POTENTIAL AREAS OF CONCERN (PAOCs)				
On-site Soil	Sediment	Residues	Ground Water	Surface Water
Area 1; Area 2; Area 3; Area 4 Western Area	Western Drainageway; Eastern Drainageway	RR1 Stockpiles; RR2 Stockpiles; MP Stockpiles	SW Part of Site and Off-Site Area Immediately Adjacent	Western Drainageway; Eastern Drainageway

POTENTIAL EXPOSURE ROUTES							
	On-Site Soil	Residues	On-Site Sediments	Off-Site Sediments	On-Site Ground Water	Off-Site Ground Water	Surface Water
Potentially Affected Population	Construction Worker; Employee; Trespasser; Future Resident ²⁹ ; Ecological Receptors	Construction Worker; Employee; Trespasser; Ecological Receptors	Construction Worker; Employee; Trespasser; Future Resident ²⁹ ; Ecological Receptors	Resident; Ecological Receptors	Construction Worker; Employee; Future Resident ²⁹	Resident	Construction Worker; Employee; Trespasser; Future Resident; Ecological Receptors
Exposure Route(s)	Ingestion/ Inhalation; Soil Leaching to Ground Water; Potential Ecological Impacts	Ingestion/ Inhalation; Residue Leaching to Ground Water	Ingestion/ Inhalation; Soil Leaching to Ground Water	Ingestion/ Inhalation; Soil Leaching to Ground Water; Potential Ecological Impacts	Ingestion	Incidental Residential Exposure	Secondary Residential Exposure; Potential Ecological Impacts

²⁹ This scenario is hypothetical, as residential development of the Site is not permitted under current zoning ordinances and a deed restriction that limits future use of the site to commercial/industrial was filed with the Montgomery County Recorder of Deeds on November 4, 2004.